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EDITORIAL

ANIMAL HUSBANDRY

We publish in this number of The Veterinary Journal an article on "Animal Husbandry in the Southern Sudan," to which we draw the attention of our readers. It illustrates clearly the difficulties which exist in parts of the world concerning attempts to control even the major diseases of livestock. The necessity for research into the cause and control of these major diseases has been emphasised many times, and we are aware that the problem is receiving attention: the relationship of disease control to animal husbandry must be kept in the foreground of the picture. The health of livestock embraces many subjects and calls for the attention of workers and observers in different fields. While considerable progress can be recorded from the results of the work of investigators in their studies of methods of disease control, we feel that, up to the present, sufficient attention may not have been given to the various essential underlying principles upon which we can build up disease control measures likely to be effective. The subject of animal husbandry embraces a wide range, and in different parts of the world different methods may have to be applied to ensure the raising of livestock in a state of general health. Nutrition stands out clearly as one of the major problems, and linked with it are many subjects which demand the attention of workers who have been trained and have specialised in the various branches of agriculture. The closest linkage between all concerned, including those dealing with methods of disease control, is essential in the development of a healthy livestock population. We must also bear in mind the education of the owners of the livestock, for, no matter how far our studies may progress, no matter what recommendations may be made, the appreciation of the situation must be brought home to the owners themselves before we can hope for improvements.

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General Articles

THE ANATOMICAL CLOSURE OF THE FORAMEN OVALE IN THE EQUINE AND BOVINE HEART: A COMPARATIVE STUDY WITH OBSERVATIONS ON THE FŒTAL AND ADULT STATES*—II

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(*Concluded from page* 118)

The Nature of the Fossa Ovalis and Related Structures in the Adult

The changes which have been initiated in the foramen ovale and its valve continue into the first year of life. It is, therefore, of some consequence to note the ultimate fate of some of these "fœtal structures superfluous in the adult."*

Equine

The fossa ovalis in the adult is in the form of a cone-shaped fossa situated immediately dorsal to the coronary sinus. The circumference or rima of the fossa is usually more oval than the circumference of the fœtal foramen. The cranial half of the rima or entrance to the fossa is formed by the well-marked crista dividens which is situated at the caudal end of the tubercle of Lower. The free edge of the tubercle is distinct from the free edge of the crista dividens, the two being separated by that portion of the tubercle referred to as the atrial elevation. (See Fig. 7, A.E.) The caudal half of the rima is not so distinct. The apex of the fossa, which is usually blunt, is quite distinct and often shows a few pectinate areas, the remnants of the fœtal net. The average depth in the pony varies between 13-20 mm. In some cases the fossa is poorly developed, there being merely a nondescript pit.

The atrial elevation, i.e., the caudal root of the tubercle of Lower, forms a distinct area of the inter-atrial region extending from the crista dividens caudally to the free edge of the tubercle cranially. (See Fig. 7, A.E.)

The tubercle of Lower commences dorsally at the root of the two venæ cavæ and passes ventrally and cranially across the inter-atrial wall. Its free edge, as seen in this plane, is directed cranially. (See Fig. 7, L.) Its function is to separate the posterior and anterior caval streams and to direct the anterior caval flow into the right ventricle. Prior to and at birth it is not fully developed, since in fœtal life the greater part of the posterior caval stream enters the left atrium via the foramen ovale (Barclay *et al.* 1941); it thus serves chiefly to direct the anterior caval flow into the right ventricle. In adult life the tubercle becomes fully functional and extends, in a characteristic horse-shoe shaped fashion, above the atrial elevation, across the right atrial roof and, in varying degree, down the right side of the atrial wall.

In the left atrium it is often difficult to find any remnants of the net. In some cases there may be a nodular area of white scar tissue to indicate its position, in others a small number of reticular areas. (See Fig. 6, A.P., figure in previous issue.) The atrial ridge tends to become confluent with the ventral

* As mentioned by Galen (A.D. 200) and quoted by K. J. Franklin, *Annals of Science*, *5*, p. 57.

edge of the adjacent pulmonary veins, but its position and relation to the left wall of the fossa can still be seen in a cross section at this level. To the student of fœtal structures the most marked feature in this atrium is the two large common openings of the pulmonary veins.

Bovine

The fossa ovalis in the adult is not so well marked as in the equine. It is more anterior in relation both to the anatomical termination of the posterior vena cava and the coronary sinus. The size of the left coronary vein is augmented by the main azygos drainage. (See Fig. 2, A.Z., figure in previous issue.) The amount of blood entering the heart by the coronary sinus is, therefore, considerable both in the fœtal and adult hearts.

The entrance to the fossa is definitely ellipsoidal and narrowed cranio-caudally. (See Fig. 8, F.O.) This is due partially to the method of closure and partially to the proximity of the tubercle of Lower, which tends to give the rounded edge of the crista dividens a more caudal direction. The average depth in the shorthorn type is about 13 mm. and depends on the amount of the valve that has been occluded.

The atrial elevation is very small and in many cases may be altogether absent; the tubercle of Lower arising more caudally and co-terminal with the crista dividens.

The tubercle of Lower is flattened cranio-caudally. It passes dorso-ventrally across the atrial wall parallel with the crista dividens. Its free edge is directed towards the right; it extends over the roof but is not prolonged to the right side of the atrial wall. (See Fig. 8.)

In Eutheria the vessels entering the heart caudally are the posterior vena cava and the coronary veins. In the equine heart the coronary inflow is small, but in the bovine heart it is relatively large, as it is augmented by the main azygos drainage. It would appear, therefore, that in the fœtus as well as in the adult this relatively larger inflow into the right ventricle from the caudal direction necessitates a separation of the two streams by the tubercle of Lower. It is suggested that the difference in size and position of the tubercle in the equine and bovine is associated with the fact that in the latter the main azygos drainage enters the heart with the coronary veins, i.e., caudal to the tubercle of Lower.

In the left atrium there is little evidence of the fœtal net. A few pectinate areas mark its position. It is more cranial than the corresponding scar in the equine and is not opposite the fossa ovalis. The atrial ridge passes along the inter-atrial wall, it is in greater evidence than in the equine but tends to disappear in time. The two large common openings of the pulmonary veins are again a marked feature.

Discussion

In the course of this investigation it has been recognised that at birth the increased pulmonary venous return to the left atrium at the expense of the inflow through the foramen ovale is a factor of some consequence in bringing about functional closure. In addition, the disposition and orientation of some of the pulmonary venous openings are such as to cause these veins to discharge their contents directly on to the tubular valve and so assist in producing its

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apposition. (Franklin *et al.* 1940, Amoroso *et al.* 1942.) Furthermore, it has been shown that the valve of the foramen ovale in the equine and the bovine is in the form of a widely dilated membranous tube and can be divided into fenestrated and non-fenestrated areas, the former being in general confined to the apex of the valve.

With the condition established at birth of an increased pulmonary venous return to the left atrium the whole valve becomes apposed and functional closure is effected and maintained by impingement of proximate blood streams on to the non-fenestrated area. This more complete participation of the non-fenestrated area in effecting functional closure greatly facilitates the subsequent organisation of the more or less apical fenestræ. This it does by sheltering them from the effects of any immediate pressure changes in the right atrium which might otherwise prevent them from playing their dominant role in leisurely and effectively sealing the opening during the stages of anatomical closure. It is in order to emphasise both the anatomical and functional differences between the two portions of the valve during the actual stages of closure that the term "atrial ridge" has been applied to that portion of the proximal non-fenestrated area upon which impingement is greatest.

The further steps in the organisation of the cicatrix and the eventual occlusion of the foramen ovale have already been sufficiently dealt with and need not be alluded to again. Reference must, however, be made to the persistence in many cases of pectinate areas—remnants of the net (cicatrix)—in the depth of the fossa in the adult.

Turning now to the coronary sinus and the tubercle of Lower, attention has already been drawn to the greater coronary inflow and the very evident dissimilarity of the tubercle of Lower of the bovine as compared with the equine. From these considerations it becomes evident that the problem to be resolved is that of ascertaining in what respect these differences in the character of the tubercle in the two genera are to be correlated with the varying coronary inflow. It has been suggested that the orientation and form of the tubercle of Lower in the bovine is dependent on the larger coronary inflow, but in the absence of conclusive evidence this suggestion must be considered tentative. This alteration in the position of the tubercle is such that its free edge in the bovine is nearer the crista dividens than in the equine. In order to emphasise this relationship the caudal portion of the tubercle, i.e., the portion that is often almost entirely absent in the bovine, has been designated the "atrial elevation." In the majority of subjects this elevation of the atrial wall between the fossa ovalis and the entry of the anterior vena cava is one of the most striking features in the right atrium of the adult equine.

Goubaux (1875) gave the time of anatomical closure of the valve of the equine as 2 months 9 days, and for the bovine 39 days. In the course of this investigation a closed foramen in the equine has been observed at 15 days, while the foramen was occluded in a bovine 20 days post-partum.

The occurrence of persistent foramen ovale does not appear to be very common in the bovine and equine. Fleming in his translation of Chauveau (1907) quotes Zangger and Zundel as having recorded it in foals and even in horses. Goubaux has collected 15 cases of this kind, 13 of which occurred in

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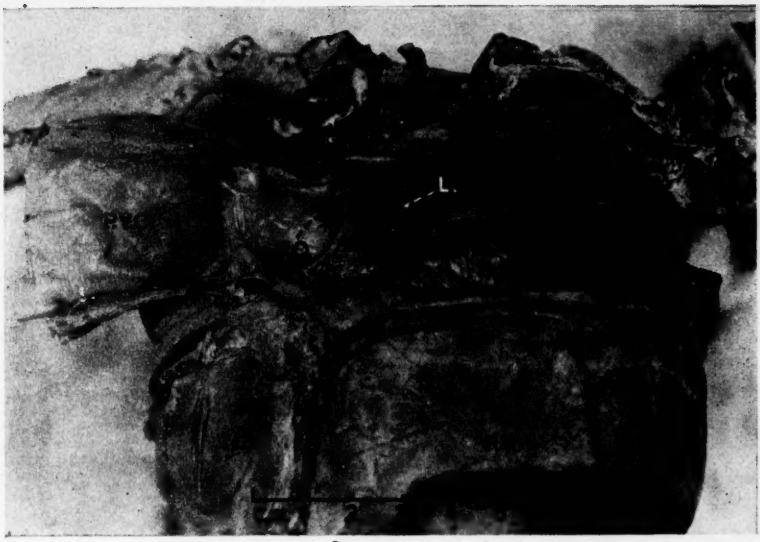

FIG. 7.—Equine, rising 7 years old, right view, posterior and anterior venæ cavæ slit open, right wall of right atrium removed. The atrial elevation (A.E.), interposed between the crista dividens (C.D.) and the free edge of the tubercle of Lower (L.), is well shown. In this heart the crista dividens is prolonged more ventrally than is usual.

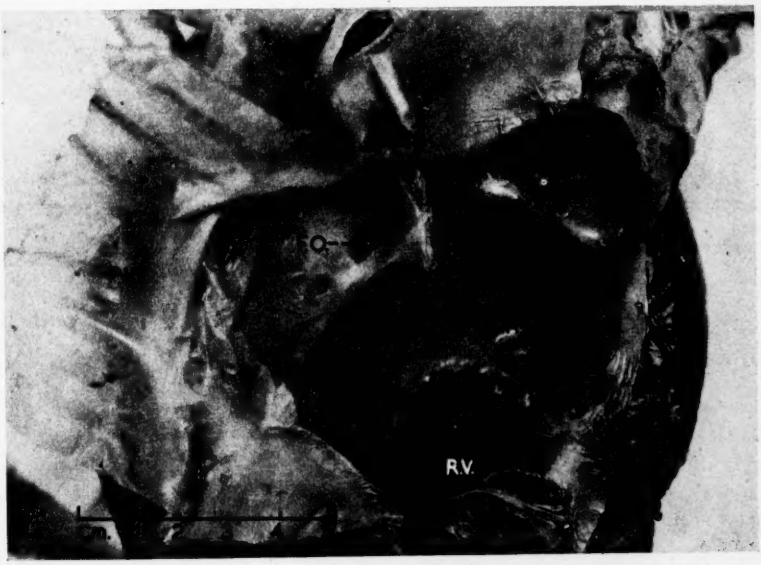

FIG. 8.—Bovine, 15 months old, right dorsal view, posterior and anterior venæ cavæ and right wall of right atrium slit open. The ellipsoidal outline of the entrance to the fossa ovalis (F.O.) is well shown. Note the proximity of the tubercle of Lower (L.) to the crista dividens (C.D.) and the direction of its free edge—towards the right.

A.E.	Atrial Elevation.
A.V.C.	Anterior Vena Cava.
C.D.	Crista Dividens or limbus fossæ ovalis.
C.S.	Coronary Sinus.
F.O.	Fossa Ovalis.
L.	Tubercle of Lower.
L.V.	Left Ventricle.
P.V.C.	Posterior Vena Cava.
R.A.	Right Atrium.
R.V.	Right Ventricle.

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the bovine. This infrequency of the occurrence of patent foramina in animals possessed of a tubular valve is what must be expected since the conception of the structure of the valve outlined in the present account implies differentiated regions in which special processes have been localised. It is suggested, therefore, that a persistent foramen will only result when the fenestrated area fails to undergo preliminary thickening and sufficient organisation to seal completely the opening, even though the non-fenestrated area remains apposed.

Wilson (1943) records a case of patent foramen ovale in a foal two hours after birth and quotes Williams as having seen two cases. In the case reported by Wilson he describes and pictures an opening in the fenestræ of the valve and an opening anterior to the limbus fossæ ovalis (crista dividens). There is no doubt that this defection of the inter-atrial wall was partially responsible for the symptoms described and may even have been associated with a retardation of the structural organisation of the valve. Wilson also quotes Delafield and Pruden as saying that the foramen remains partly open; that the condition prevails throughout life without ill-effects; and that it has been found by some observers in about one-fifth of their autopsies. In this connection it should be noted that in young foals, once the functional factors associated with closure have been removed by death, the foramen may appear patent if the stages of anatomical closure have not been completed.

In conclusion, it is interesting to search among the Eutheria for a simple explanation of the origin and significance of the elaborate tube-like valve of the foramen ovale found in the heart of the majority of the ungulates (Bos, Equus, Ovis, etc.) as compared with the more simple carnivor-primate type (flap valve). It is to be acknowledged that such an explanation is very far from being reached, but some of the observations recorded here are of a very suggestive nature. It is possible, for instance, that the possession of a complicated tube-like valve which ensures effective and immediate functional closure of the foramen ovale may be consequent upon the greater degree of independence and general activity observed in the newly-born of the majority of the ungulates; whereas the possession by the carnivors and primates of a simple flap-like valve of the foramen ovale may, on the other hand, be correlated with the helplessness of the early young and their greater degree of dependence upon their mother at birth.

Summary

The tube-like character of the valve of the foramen ovale in the equine and bovine heart has been stressed and particular emphasis has been laid on the different factors involved in closure of the foramen in those animals possessed of a tubular valve as opposed to those with a simple flap-valve.

The stages of anatomical closure or occlusion have been described in full, structural changes are almost exclusively confined to the valve. A closed foramen in the equine has been observed at 15 days and in a bovine at 20 days post-partum.

The valve in these species is fenestrated, the fenestrations being confined almost entirely to its distal end—the apex. During the actual stages of closure the venous return from adjacent pulmonary veins is directed more on to the proximal non-fenestrated portion. In order to emphasise this, that portion of

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the non-fenestrated area upon which impingement is greatest has been termed the atrial ridge.

Attention has been drawn to the greater coronary inflow in the bovine heart consequent upon the drainage of the main azygos vein via this route. It is possible that the difference in size and position of the tubercle of Lower in the bovine is dependent on this fact. In effect the free edge of the tubercle in the bovine is nearer the crista dividens than in the equine. In order to emphasise this, the caudal root of the tubercle has been designated the atrial elevation.

It has been suggested that cases of patent foramen ovale may be associated with failure on the part of the valve to organise and seal the foramen, even though functional closure may have been effected.

The significance of the tube-like valve of the foramen ovale found in the heart of some animals as compared with the simple flap-like valve of others may be associated with the greater degree of independence at birth in the former.

Acknowledgments

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NARCOSIS IN THE HORSE BY THE INTRAVENOUS INFUSION OF CHLORAL HYDRATE

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Introduction

CHLORAL hydrate was one of the first narcotic agents to be used in veterinary surgery and, despite the advances which have been made in the development of new, non-volatile narcotics, it remains the best at our command for the horse. Its use was first described by Humbert (1875), who gave an account of the effects produced by doses ranging from 30 to 70 grammes to horses of ordinary size. Since that time it has been used to induce depths of narcosis varying from a slight stupor to complete general anæsthesia, and it has been administered by a variety of routes, including drenching, direct introduction into the stomach by stomach-tube, colonic infusion, and intra-peritoneal and intravenous injection. The stomach-tube method is generally the most popular in this country, and quantities of 30 to 90 grammes, according to the size of the horse, are given dissolved in one to two gallons of water. The method has much to commend it; the risks associated with drenching are overcome; the irritant properties of the agent are controlled by adequate dilution, and the computed dose is given without wastage. Nevertheless, it has many disadvantages. In unbroken animals it is often impossible to pass the tube, while others will be met in which the tube, when passed via the nostril, constantly enters the trachea. Moreover, the nasal hæmorrhage which sometimes results from the method may preclude the subsequent use of inhalation anæsthesia. The chief disadvantage, however, of giving any non-volatile narcotic into the stomach is the variation in narcotic response. Numerous factors will influence its action even in healthy subjects, while in diseased ones discrepancies will be more marked. Amongst these factors are individual idiosyncrasy, the quantity and nature of the stomach contents, the degree of previous fasting and the nature of the diet before operation.

The intravenous route of administration is by no means a new one, for it was practised extensively by Army veterinarians during 1914-18. The common method was to inject rapidly a computed dose in a small quantity of water. This method has not attained popularity in civil practice because of the risks associated with it. A concentrated solution of the drug is extremely irritant, and it is essential that none shall infiltrate the perivascular connective tissue, otherwise acute local abscess formation, and possibly a serious or even fatal phlebitis, may result. Such a risk is inevitable when dealing with horses, particularly when administration is carried out in the standing position and movement cannot be completely controlled. The degree of this risk will be governed largely by the concentration of the solution used and the quantity which enters the perivascular tissues. With regard to the latter, it is likely to be greater when some method of pumping is used than when gravitational infusion is adopted. Records of fatal complications are scanty, but private conversation with colleagues indicates that they are not rare. Peck (1937) has recorded the use of a 70 per cent. solution in ponies and camels, and states that he experienced occasional phlebitis and had had one fatal case, but since adding sodium citrate to make a

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final dilution of 1 per cent. no phlebitis had occurred. Muir (1937) used 25-50 c.c.s of 100 per cent. solution in the treatment of colic and had no bad results. Hudson (1937), using the drug as a surgical narcotic, tried various solutions and finally adopted a concentration of 1 in 12. He made the injection into the vein by slow pumping and continued until the animal "went down." His experience was that a cart-horse generally fell to the ground after about 45 grammes had been introduced. Marcenac and Lemetayer (1930) were responsible for the development of the method for inducing surgical anæsthesia in the horse. They found that a dose of 5.5 grammes per 50 kilogrammes (110 lb.) bodyweight gave uniformly good results. Light anæsthesia was obtained of a depth sufficient for most operative interferences and the animal was able to regain its feet in a period of about two hours after injection. They observed that in horses which had been fasted for three or four days the same degree of anæsthesia could be obtained with 4 g./50 Kg., and also that a dosage of 6-6.5 g./50 Kg., while well within safety limits, caused the animal to remain recumbent for an inconveniently long period—three hours or more. They administered the drug with the horse in the cast position, occupying six to eight minutes over the injection. They introduced the method of adding sodium citrate to the solution with the objects of overcoming the tendency for blood to coagulate in the needle and to prevent the chloral causing hæmolysis.

Personal Experience

During the past two years the writer has used the method in seventy equine cases as a surgical narcotic. The animals have varied in age from six months to twenty years (plus), and in weight from 4 to 15½ cwts. Operations performed have been widely representative of equine surgery and have included castration of the male and female, cryptorchid castration, scirrhous cord, scrotal and umbilical hernia, poll-evil and fistulous withers, extirpation of the eyeball, amputation of the penis, laryngeal ventriculectomy, neurectomy, excision of cysts and tumours, foot and dental operations.

It has been found that the dose recommended by Marcenac (5.5 g./50 Kg.), when given to comparatively healthy horses which have not been subjected to fasting, provokes deep narcosis bordering on but not attaining general anæsthesia. The maximum depth is attained about eight minutes from the commencement of the injection, and from that point narcosis slowly and progressively lightens. The time elapsing before the horse is able to regain and maintain the standing position varies from 45 minutes to four hours; the great majority remaining "down" about 1½ hours. This is followed by a period of drowsiness lasting a further four hours. It has been observed that the degree of narcosis obtained with a unit dose is less in light horses than in heavy ones (this finding is similar to that with the barbiturates in the dog). The aim in using chloral hydrate has been to induce a degree of narcosis whereby operations under local or regional anæsthesia can be performed without voluntary movement, or whereby general anæsthesia by inhalation becomes greatly facilitated. If the drug is given in doses capable of provoking general anæsthesia, the period of recumbency will be inconveniently long. The dose recommended varies from 5 to 6 grammes per cwt. for horses of light to medium size, and in heavy animals from 4.5 to 5 grammes per cwt. In computing the dose the operator will be guided not only

by the proportionate weight of the animal, but also by the severity and duration of the interference.

In all cases the induction of narcosis has been quiet, and nothing in the nature of narcotic excitement has been seen. When the drug is administered slowly in the standing position the response is regular. The animal commences to sway: falls backwards on to its buttocks and then on to its side, with its limbs passively extended. This point is reached when a dosage of 4.5-5 g./cwt. has been given. Medium depth narcosis is present, but skin sensation is not lost and a painful interference will provoke sluggish struggling. Relaxation of the tail is incomplete, and there is lateral rotation of the eyeballs. In many cases the degree of narcosis attained is sufficient for the purposes of the operation which is performed under local infiltration anæsthesia. In others it may be decided to complete injection after the horse has been restrained. When the animal has been cast and restrained first, the whole computed dose is given. In deep narcosis the movement of the eyeball ceases, the tail becomes relaxed and the penis often protrudes from the sheath. Respirations are slow, but regular and deep. The pulse rate is accelerated, generally about 70 beats per minute. The corneal reflex is active and the pupils are slightly constricted.

In the great majority of cases, also, the period of recovery is quiet; in fact, in many subjects a state of hypnosis succeeds that of narcosis. Occasionally, however, the recovery period is associated with vigorous struggling (in the series under review it occurred on two occasions), and thus the hobbles should be left on the animal until it makes obvious attempts to rise. This is particularly important when operation is being performed in a confined space.

In no case has any systemic toxicity been observed, nor has there been any post-anæsthetic malaise. One of the striking features of the method is the vigour with which the animal commences to feed on return to the stable. In two cases a local inflammatory reaction developed near the site of injection due to the introduction of a small quantity of the solution into the perivascular tissues, but neither was serious. In one a diffuse cellulitis developed on the ventral aspect of the neck, but there was no pus formation and resolution occurred in 14 days. In the other, in addition to the cellulitis, a small abscess developed in front of the presternal cartilage. In each case the vein remained patent. In three animals paralysis of a fore-limb occurred. This accident was not directly ascribable to the chloral, but was due either to injury during casting or to prolonged recumbency in the lateral position. The writer believes the latter to be the more probable cause, and for this reason, when recumbency is prolonged, has the animal turned over every half-hour. In two cases the radial nerve was involved and the paralysis was temporary only; in the third the suprascapular was the nerve concerned and the paralysis was permanent. This latter case was entirely exceptional. The animal, a mare weighing 13½ cwt., for enucleation of the eyeball, was given 75 grammes in the cast position, augmented by local infiltration and chloroform inhalation. During the period of recovery there was violent movement, the mare indulging in galloping movements while lying on her side. She was unable to rise for four hours after the induction of narcosis.

Mode of Administration

One's first reaction in considering this matter is that whenever possible the

drug should be given with the horse in the standing position so that it falls to the ground in a state of narcosis. Clearly this procedure is more humane than to cast forcibly the fully-conscious animal. Furthermore, by it the risks associated with forcible casting are eliminated. But in practice many other considerations govern one's procedure. "Unbroken" or fractious animals may not remain still while injection is being made, yet to avoid with certainty undesirable sequelæ this is essential. Again, the place in which operation is to be performed requires consideration. If space is confined and it is necessary for the animal to fall in a strictly limited area, it may be better previously to cast it. Although, if the animal is quiet, it is still possible to adopt the standing method; the hobbles being loosely applied before injection is commenced, or during its course, and the animal cast as it commences to fall. Conversely, animals will be met in which the application of casting tackle causes fear and struggling. In many of these administration in the standing position is indicated. A further disadvantage of the standing position is that the technique of injection is more difficult. The operator will consider all these points in making his decision.

Technique.—The horse is weighed and the dose calculated. Under field conditions it is improbable that weighing facilities will be available, but the following figures obtained from the writers' series may be helpful:—

Ponies	4½– 8 cwt.
Cobs	9 –11 „
Cart colts—	
Yearlings ...	6 – 8 „
Two year olds ...	8 –10½ „
Hunters	9 –12 „
Half-legged vanners ...	11 –12½ „
Heavy vanners ...	13 –15½ „

Hodgkins *et al.* (1943) have recorded a formula for estimating the weight of horses:—

$$\frac{G^2 \times L}{300} = W.$$

"G," girth in inches; "L," length in inches from point of shoulder to the buttocks over the ribs and under the hip; "W," weight in lbs. The writer has had insufficient experience of its use to assess its accuracy.

If administration is to be in the standing position, estimation of bodyweight is quite satisfactory, provided sufficient chloral solution is prepared, for horses generally go down at a constant depth of narcosis. If deeper narcosis is required, an additional quantity of about one-fifth that already injected is given.

The chloral hydrate is dissolved in tap water in a concentration of 10 per cent., and to this is added 1 per cent. of each of sodium chloride and sodium citrate, e.g.:—

Weight of horse ...	10 cwt.	Dose 5 g./cwt.
Chloral hydrate	50 grammes	
Sodium chloride		
Sodium citrate, āā ...	5 grammes	
Water	500 millilitres	

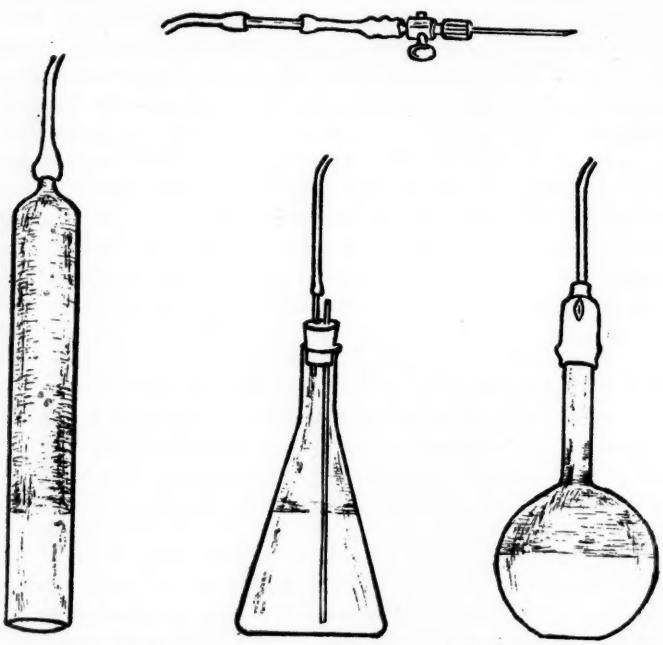
The solution is prepared in a litre flask and sterilised by boiling. The

needle recommended for the intravenous injection is 6 cm. long, with a bore of 2 mm. (11 B.W.G.). It is an advantage to have one made fitted with a "grip" to facilitate its being thrust through the skin. It is of benefit also to have the needle-adaptor fitted with a tap which may be turned on or off at will. The injection is made by gravity and several types of apparatus are suitable. (See figure.) The writer prefers a flask fitted with inlet and outlet tubes. The method is a clean one and is unlikely to "go wrong." The rubber tubing is 0.8 cm. broad and 1 metre long. It is fitted with a "window" close to the needle-adaptor. All apparatus is sterilised by boiling.

Standing Position.—If possible a twitch is avoided. Its application, particularly in young subjects, tends to provoke, rather than prevent, head movement. Again, its use often provokes tensing of the neck and thus obscuring of the jugular furrow. An area of skin over the furrow about half-way down the neck on the left side is clipped and cleansed with alcohol. An insensitive skin weal is produced by the injection of 2 c.c.s of 2 per cent. procaine hydrochloride solution, using a short, fine needle. When local anæsthesia has developed, the intravenous needle is thrust through the skin over the vein, with its point directed towards the head. It is then partially withdrawn until a length of about 1 cm. only lies in the connective tissue. (In a number of cases it has been found that the needle has cut out a plug of skin which occludes its lumen and thus a rule is made to pass a stilette through the needle before attempting to thrust the latter into the vein.) The next step is to raise the vein by digital pressure below the site. It may be preferred that an assistant shall do this, although it is quite easy for the operator to do it himself with the thumb of his left hand. If the latter method is adopted, the vein should be raised just below the site of injection, for in this way the skin is tensed also. The distended vein can readily be palpated beneath the skin; in an average case it attains a breadth of 2 cms. The point of the needle is then directed towards the vein; thrust into it and pushed up its lumen a distance of about 2 cms. It is important that an appreciable length of needle shall lie in the vein, otherwise there is a risk that as the vein subsides, on release of pressure, it is drawn off the needle, for the skin fixes the position of the latter. This error has been experienced on a number of occasions. Moreover, if this provision is not made, it is probable that the slightest movement will cause the needle to leave the vein. That the needle is in the vein is indicated by a free flow of blood. If the flow comprises an occasional drop only, it may be concluded—(a) that the needle is not in the vein but in a perivascular hæmatoma, or (b) that it is in the vein but its lumen is partially blocked. It may be contended that the needle should penetrate the vein in a downwards direction, so that the injection is made in the same direction as the venous flow. This is of no consequence when using a gravity apparatus, for whatever the direction in which the solution enters the vein, it is quickly taken up in the general venous flow. Technical errors, such as transfixation of the vein, are more likely to occur if the needle is thrust in the downwards direction. During this time the gravity apparatus is held by an assistant standing at the operator's side. When the operator is satisfied that the needle is well in the vein, he releases pressure, picks up and attaches the adaptor to the needle and opens the tap. The assistant immediately lowers the flask and blood appears at the window. (Here again it should be emphasised that when the vein is

properly penetrated the window becomes completely occupied by blood. If none, or a trace of blood only appears, it is evidence that the needle has left the vein. In such a case, the tap is turned off, the adaptor attached and a further effort made to introduce the needle into the vein.) On the appearance of blood at the window, the flask is raised as high as possible and injection thus commenced. During this period it is well that the man at the animal's head shall cover the near eye, so that movement of the flask does not cause alarm.

The rate at which injection is made will depend on the height at which the flask is held and the diameter of the needle-adaptor. Using the apparatus pre-



viously described, held as high as is comfortable for a man of medium height, the infusion of 750 c.c.s occupies about four minutes. When a smaller quantity is being used the flask is held a little lower. The object is that a dose sufficient to cause the animal to fall shall be given in about four minutes. With a little experience of the method, a reasonably accurate idea of the correct rate of flow is acquired. Should there be any movement of the horse during administration, it is essential that a check shall be made that the needle has not left the vein. This is done by lowering the flask. If blood appears at the window, all is well and the flask is raised again and injection continued. If it does not, the tap is immediately closed and steps are taken to correct the matter. It may be decided to use the other jugular vein for completion of the injection. It is important during injection that there shall be complete quiet and that onlookers shall stand still. The greatest tendency to movement will occur during the first two minutes of injection. After this time the animal has generally received sufficient chloral hydrate for it to be uninfluenced by extraneous stimuli. Towards

the end of the injection watch is kept for signs of the animal falling. The moment it commences, the tap is turned off and the adaptor detached. The blood will again flow from the needle. This serves to ensure that the residual solution is washed from it. A further technical point worthy of mention is that during the injection the operator should hold the needle and press it gently and continuously against the animal's neck. The object is that should the animal move its neck, the hand (and the needle) will move with it, this overcoming the tendency for the drag of the apparatus to pull the needle out of the vein.

Cast Position.—In the cast position the technique of injection is more certain and easy. With the animal's head drawn well back and fixed, the vein and the skin over it become tensed. Again, with the animal lying on its side, lateral movement of the neck is prevented and insertion of the needle becomes more precise. The primary skin weal may be dispensed with. The whole of the computed dose is given in 4-5 minutes. It is very improbable that any break in technique will occur, and, provided other factors do not preclude its use, the writer is tending to use the cast position as the routine method.

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ANIMAL HUSBANDRY IN THE SOUTHERN SUDAN

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THE following notes on native animal husbandry were made during my period as Veterinary Research Officer at the Serum Laboratory in Malakal, Sudan.

They form rather a contrast to the discussions on soil fertility, balanced feeding and obscure dietetic conditions of to-day, and may help to remind us that there are big tracts of the world, such as Southern Europe, Africa and China, where life is still very primitive and the struggle for existence is the first consideration.

The cattle-owning tribes of the Southern Sudan must form a unique section amongst the many cattle tribes of Africa. They are an individualistic people living under what can only be termed trying conditions. They have to be prepared for seasons of extreme drought, alternating with floods which may carry away everything, including their homes.

In addition to combating the elements they have had to resist the invasions of the Northern Arabs, coming to enslave them or to steal their grazing grounds.

The various tribes—the Shilluks, Dinkas and Nuers are negroid in appearance, dark skinned and very tall, many of them being 6 ft. 7 in. or more. They live a communal life in small villages lying along the Nile valley.

Their whole tribal system is built around their love of cattle. They tend cattle all day, litigate interminably over cattle, compose songs about their cattle, and generally live for the day when they will have more cattle.

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Being so cattle-conscious, and at the same time ignorant, they presume that they are possessed of an expert knowledge in cattle rearing, and it is amusing to watch the expression on a native's face when it is suggested that his cattle could be greatly improved. The expression is one of amazement that such an obvious greenhorn should endeavour to explain cattle to a man—reared on milk impregnated with cow's urine and covered from top to bottom with dust from a dung fire.

The native may carry out any suggested change for two or three days, but soon returns to his old methods.

Having lived at a starvation level for years and been delighted with meat from a cow already dead for several days, it is difficult for the native to envisage a carefully fattened animal or a cow kept purely for its milk productions.

Because of this natural scepticism and ignorance, the only way to teach a native the value of improved methods of animal husbandry is by the maintenance of model herds. The native's wealth consists of his cattle, sheep and goats. All three are generally by European standards kept in a very emaciated condition, and can only be considered to have been selected by a natural law, i.e., the survival of the fittest.

The cattle, a blend of the ancient Hamitic Longhorn and the Asiatic Zebu, have long heavy horns and a distinctive Zebu hump. An average adult animal would weigh about 7½ cwt. live weight.

The animals are more often selected for their colour or horns than for their condition. A brown bull with white eyelashes and long horns, although in poor condition, will often be preferred to a black bull with shorter horns and in excellent condition.

Terrain

The Southern Sudan, especially the Upper Nile Province, could be described as a flat expanse of grass land extending for many miles on either side of the valley of the Nile.

For six months of the year, in the wet season, the land is covered by an abundant growth of long coarse grass (7 to 8 ft. high), which would provide nourishment for many head of cattle, but on the onset of the dry season—from October to May—the land, which had been in many places water-logged, becomes a hard dry concrete-like mass. The grass, so abundant, becomes dry and straw-like, with no significant nourishment, and before the season is finished it has practically all been burned in the vast grass fires which range over many miles. The result of two such extremes of season is that for half the year —during the heavy rains—there is a vista of greenness with an excess of water, and in the other half—as a direct contrast—there is no rain and the country becomes a waterless waste with only small patches of grazing around the river banks.

To adapt themselves (without the use of artificial means such as dams, irrigation channels and pumping plant) to such extremes of climate, the natives have adopted a largely nomadic life, although there is still maintained a nominal home.

Mode of Life

During the dry season the cattle are driven to camps never more than three

to four miles from the river banks. The camps are semi-permanent, in that they are used year after year. The sites are chosen from previous experience, as it is known that even in the driest years certain areas will be the last to dry out, and there will always be some grazing left to tide the cattle over till the start of the rains.

In the event of the normal grazing areas failing, there are usually small islands in the Nile to which the cattle may be swum. The islands are swamps during the rains, but become inhabitable for a short period towards the end of the dry season. The camps are built of wooden palisades bound together with thorn bush, and are usually about 20 yards broad by 15 yards long. Up to 100 cattle are kept in each camp. At night the cattle, inside the palisade, are tethered to stakes in the ground, and a dung fire lit opposite each group of five animals.

In one corner of the camp is built a small house or shelter of millet stalks, where the cattle-minders will sleep.

While stationed at the dry season camp, the natives usually erect for themselves several semi-permanent dwellings. These consist of circular huts of millet stalks thatched with grass.

In some tribes the whole family may move to these dwellings and a continuous village life can be maintained. In other cases, where the grazing areas are often far distant, only the young men move with the cattle, and a more permanent life is carried on at the wet season grazing grounds.

Life in the cattle camp begins at dawn, when the cattle are groomed and the cows milked. At 7 a.m. the cattle are untethered and driven off to the nearest grazing and watering ground, the cows and bulls going in one batch and the calves in another. Several men are usually left behind to collect and spread the night's dung so that it may be dry by evening and ready for use on the smoke fires. The smoke fires are to keep off both wild animals and mosquitos.

After a day's grazing the cattle return to camp at 4 p.m. The calves are released to suckle their dams, after which the cows are milked. An average cow may give three pints of milk a day after meeting the needs of her calf.

As can be imagined, the calves are very thin, and have to subsist on what milk they can get while initiating milking and when stripping the cow.

The cattle in a camp are usually owned by individual villagers and the herd as a whole is looked on as a form of bank, where the cattle are deposited until such time as they may be required either for the payment of fines, to be sacrificed at a wedding or funeral ceremony, or to provide the dowry for the purchase of a wife.

Wives are fairly expensive. In the Shilluk tribe, for instance, a wife costs seven cows and three bulls.

As the cattle are looked on rather as assets than as a source of food, it is very difficult to persuade the native to sell his cattle or to take part in any organised slaughter policy in time of famine.

Towards the end of the dry season, when the grazing has become poor and in some places scarcely existent, the cattle lose condition and are readily susceptible to any outbreaks of disease. During this time there are liable to be considerable losses from cattle plague, bovine pleuro-pneumonia, and foot and mouth disease.

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When the rains start, in May or June, the cattle move off to the rainy season grazing ground.

In areas which become heavily flooded the cattle may move a considerable distance, but where the river banks are high the wet season cattle camps may be only a few miles distant from the dry season camps.

In an established village there are usually 20 to 40 men, with a head-man, and a total of about 150 cattle. The villages are found in groups of 20 to 30, about half a mile apart from each other.

Waiting for the arrival of the cattle is a luak (cattle shed), which has been built by the old men and women of the village. The luaks are round and built of mud, wood and dried grass. The base is of branches of wood about five feet high. The branches are firmly dug into the ground and bound together with intertwining branches and a solid plaster of mixed mud, dung and dried grass.

On top of the wooden base is built a conical roof, consisting of a network of intertwining branches supported by long poles meeting at an apex. To this framework is added a covering of thatch, made from bundles of dried grass packed tightly together. The average luak is 18 ft. high. On one side is an entrance which is arched and just sufficient to allow a cow to enter.

During the rains, when the intensity of biting flies and mosquitoes has to be experienced to be believed, the cattle are kept in the luaks from four in the evening till nine o'clock in the morning. While in the luak the cattle are tethered to stakes, and in the centre are built several dung fires, the smoke of which permeates the whole building. The atmosphere is sufficient to discourage all but the hardiest mosquitoes.

The young men and cattle men sleep naked by the side of the fires. (As can be imagined, acute conjunctivitis and permanent damage to the eyes is common amongst young cattle men.)

It has been found by experience that of cattle left outside during the rains only the hardiest survive. Apart from the perpetual worry of biting flies, the extremes of temperature form a continual strain on the system.

During the day grazing is so abundant that the animals do not have to be driven very far from their camp to graze. At the beginning of the rainy season the women and older men do what is known as "their cultivating." This consists of turning over a small piece of land near the village, which is then planted with millet seed. In a good season enough millet is harvested to form a store which will last till the next season's crop is gathered in, but when the crop fails or is eaten by locusts the natives are faced by famine and depend on the Government shipping grain from the north to tide them over.

Husbandry

The cattle live on the available grass and bushes and do not have any other source of nutrition. When the grass is best, at the beginning of the rains, the cattle look very fit, and some of them lay down small stores of fat, but towards the end of the dry season, when the main grass supply consists of dry, brittle stalks, it is only the sturdiest of animals that retains its bloom.

The natives are fond of their cattle and groom them for hours on end. The individual owner always ensures that his particular cow gets its fill of grass.

The calves are badly reared, getting little milk, and it is the calf which

first learns to eat grass which is most likely to survive. Milking is very primitive, the cow and calf are tethered close together, the calf being released to initiate the first flow of milk. It is a lucky calf that gets more than two or three gulps of milk before it is removed to be retethered near its mother. The cow is milked out and the calf is allowed to complete the stripping. Despite such a starvation diet in youth, a surprising number of calves reach maturity.

The natives have no real knowledge of the animal in sickness. They are slow to notice signs of disease and generally allow a sick cow to die. Very few will carry grass and water to a sick animal, and once it lies on its side it is left to die.

As most of the diseases take the form of epidemics, the native's general reaction to any outbreak of disease is to move his cattle quickly from an infected area and to employ a witch doctor, who he hopes can produce a rapid cure.

A common form of treatment is to cut off the end of the tail (is this practice yet obsolete in England?); another is to sacrifice a goat or sheep and sprinkle its blood on the cattle.

In addition to cattle, the natives keep sheep and goats and occasionally poultry. The keeping of poultry, however, is considered by some tribes to be rather unmanly.

There are three unusual habits in animal management which are worthy of record.

(a) In times of famine it is a common practice to supplement the human diet by obtaining whole blood by venesection. The animal's jugular vein is opened with a spear and a pint or two of blood extracted.

(b) When a cow loses its calf the supply of milk also disappears, and in an effort to restimulate the milk supply either a dummy calf is set by the cow at milking time or a most peculiar system of milk stimulation is practised.

The cow is tied to a stake and the milker opens the lips of the vulva and puts his mouth and part of his face inside. Then his face violently contorts as he alternately blows and sucks. During this operation the cow stands contentedly, although occasionally looking round as if in amazement. After about three minutes of physical effort, plus massage of the udder, the milk commences to flow and the cow may then be milked.

(c) It is common for cow's urine to be added to milk before it is drunk.

Diseases

The common diseases found amongst cattle in the Southern Sudan are cattle plague, bovine pleuro-pneumonia, foot and mouth disease, and trypanosomiasis.

Cattle plague can still be considered the major scourge, as it kills off large numbers of cattle in epidemics every year.

It is probably as a reaction to probable losses from epidemics and drought that the native has adopted his policy of keeping numbers of cattle rather than quality.

The native's invariable response to an outbreak of cattle plague is to move his herd from the infected area, leaving sick cows behind to die or recover as providence decrees.

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Instead of limiting and controlling the disease, this method leads to its spread throughout the country, and also may indirectly cause tribal fights.

At present, the major supplies of serum and vaccine are allocated mainly to natives who are willing to co-operate with the Government either by selling their cattle or by giving them to the serum laboratory in exchange for vaccine.

To assist the District Commissioner in controlling outbreaks, the Veterinary Service trains in disease recognition and control any tribal police whom the Commissioner may send in for training. The more intelligent and literate natives can be trained to identify the various diseases, and in the methods to be adopted in the case of outbreaks.

When outbreaks, which it is vital to control, occur, a trained native stockman with several tribal inoculators is sent to the point of the outbreak. There the cattle are gathered together and all non-infected animals are given the prescribed dose of serum. The passive immunity induced is converted into an active one by smearing infected discharges on to the noses and mouths of the inoculated animals.

To form a safe ring around the area of the outbreak, cattle in the surrounding cattle camps are given vaccine. The control of outbreaks far from the veterinary laboratory is in the hands of the District Commissioner and his veterinary inoculators, the Commissioner being supplied with a limited amount of serum every year.

Hampering all control measures are the difficulties of terrain, bad roads, great distances and, in places, practically impenetrable swamps. The serum used in outbreaks is hyperimmune serum preserved with 0.5 per cent. phenol and 1 in 50,000 acriflavine—the dose in adults being 30 c.c.s. Vaccine is a glycerinised spleen and lymph pulp vaccine.

Bovine Pleuro-pneumonia

Bovine pleuro-pneumonia is common in the Southern Sudan, but by reason of its slow onset does not show itself in the form of epidemics but rather as severe outbreaks in circumscribed areas.

It is in many ways a more difficult disease to control than cattle plague, because of its insidious nature, and the natives' reluctance to kill any animal which can still breathe.

If active measures, such as vaccination and the slaughter of infected cases, are taken, the disease can be slowly eliminated from an area. But when vaccine has to be issued without a compulsory slaughter policy it is of doubtful value.

One has no great difficulty in getting a native to use a free vaccine, but to induce him to slaughter infected cases because of their danger of becoming recovered carriers is as difficult as persuading the British farmer to kill his tuberculin positive cows even with compensation.

Vaccine is issued in appreciable quantities to the natives, but with the difficulties of transport and the short-lived value of vaccine outside the refrigerator it is only amongst mission and district commissioners' herds that one can feel it has served a really useful function.

Bovine pleuro-pneumonia vaccine is used in 2 c.c.s doses, 1 administered subcutaneously.

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Foot and Mouth Disease

Foot and mouth disease is endemic. It is usually found occurring as outbreaks towards the end of the dry season when the cattle are in poor condition.

Deaths are uncommon and are found chiefly amongst calves. If one examines the majority of native cattle, the lesions of recovered foot and mouth disease can be seen between the toes and as old scars on the tongue. When outbreaks occur, the control method adopted is to mix infected and non-infected cattle, the saliva from infected animals being then smeared on the noses and mouths of non-infected cattle so that the disease may be disseminated as quickly as possible. If no control measures are taken, the disease may remain in a district for many months, small outbreaks occurring at intervals. In an outbreak occurring in the dry season many adult cattle may die from starvation, because of their inability to eat and digest the dry grass.

Trypanosomiasis

Although tsetse fly have only been reported in certain circumscribed areas in the Sudan, the incidence of trypanosomiasis amongst the cattle in the Southern Sudan is relatively high.

The tsetse fly has been reported in the southern parts of Equatoria province and on the borders of Abyssinia. Cattle do not live in these areas, and those found on the edge of the tsetse fly belts are generally in small groups which barely survive.

In the Upper Nile Province, which consists largely of treeless plains, there are few areas where the tsetse fly could find the shade it requires. Personal observations, however, resulted in the opinion that the incidence of trypanosomiasis amongst cattle in the Province was appreciable.

Though it must be presumed that the initial infection is conveyed by the bite from tsetse flies, subsequent infection of new cases in non-tsetse fly areas may be effected on a large scale by tabanid flies.

The usual trypanosome found on examination of the blood of Sudan cattle is trypanosoma congolense. Blood smears taken at random from apparently healthy cattle frequently demonstrated the trypanosome. It appears, therefore, than congolense infection may occur in normal animals, only being deleterious to the health of the animal when there is a shortage of grass, or in cattle—such as those at the laboratory—which are under the strain of repeated bleeding.

Cattle imported from the desert areas of the Northern Sudan, however, proved readily susceptible to congolense infection and usually died after about three months. In the majority of cases noted, infection could only have been spread by tabanids.

The symptoms are typical, high temperature, 106 degrees F., anæmia, staring coat, emaciation and extreme weakness. Towards the end of the illness death is due rather to starvation than to any other cause. The animal becomes so weak from repeated febrile attacks that it is unable to graze, or if it goes to graze falls down and has to be carried back to the camp.

Treatment with tartar emetic intravenously (25 c.c.s of a 2 per cent. solution) has a palliative effect, rather masking infection than curing it, but cannot

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be recommended as the treated cow may remain as a reservoir of trypanosomes. Antimosan and Serfen "C" also proved useful for masking infection.

The only course that can be recommended to the native, in a case where a positive blood diagnosis has been made, is that he should slaughter the cow. As such a course does not appeal to him—one live cow, although a poor one, being better than no cow—the eradication of trypanosomiasis will tend to be slow.

In all measures of disease control there are several common difficulties which occur:—

(1) A herd of cattle cannot be considered as a whole, but as a series of units belonging to various individuals. Half of the owners may approve of the suggested control measures, but the other half may refuse to co-operate and remove both healthy and diseased cattle to another area.

(2) The average native cannot give a lucid description of disease symptoms. The symptoms must always be dramatic, such as large swellings all over the body, profuse salivation, and sudden death with violent contortions.

(3) Post-mortem examinations are always rather hampered by the difficulty of finding any corpse. The dead animal has generally been eaten at a triumphal feast shared by all.

As will be seen from this brief survey, animal husbandry in the Southern Sudan is still in a very primitive state. It is largely as in the beginning of time except that British influence protects the natives from the depredations of their neighbours.

Control of disease at present consists of little more than the issue of small quantities of cattle plague serum and vaccine, sufficient only to touch the fringe of any outbreak, and in the training of tribesmen in the preparation of hides and the use of vaccines and sera.

The size of the area administered (quarter million square miles) would require a very large trained staff indeed to control and report all outbreaks of disease. Moreover, there are areas liable to be under water half the year and accessible only after a trek of many days on foot and by canoe.

The issue of prophylactics, when limited in supply, must be governed by the economic factor, those areas which sell cattle for export having first call on the supplies of serum and vaccine.

It is often difficult to decide the priority claims on limited supplies of prophylactics, between cattle which are regarded as merely a form of currency and those which are, in fact, potential exports. Prior to the war the Sudan cattle did not prove to be attractive in the world market, as their meat was of poor quality and their hides thin and of low grade.

In addition to their effect on the economic state of the country, cattle have to be considered as a political factor of importance, for the average native does not wish to sell his cattle, and any action is liable to lead to discontent.

Although what has been written may sound rather discouraging for veterinary workers amongst African natives, there is much which can be achieved concomitantly with a raising of the general educational standard.

In the Southern Sudan nearly all the natives are at times undernourished, and many show the signs of malnutrition.

Agriculture, which is of primary importance to any country, is especially

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so amongst African tribes, whose whole interest at present (except in areas infested with tsetse flies) is concentrated on the maintenance of herds of cattle, sheep and goats.

In many parts of Africa the social system is bound up very intimately with cattle, and consequently any severe losses from disease disturb the social balance. Improvements in animal husbandry could hardly fail to be of benefit.

The native cattle are often of a poor type and can be improved by selective breeding both for meat and milk production.

All educational schemes should include training in agriculture and veterinary science, as the native born with an interest in cattle is more readily interested in improved stock than in clerical work. Amongst mission-trained natives are many inferior clerks who would have made useful agriculturists or stockmen.

It is recognised that development must be slow, depending as it does on the gradual education of the natives, improved communications, irrigation of land, etc.

Clinical Article

A CASE OF TRAUMATIC PERICARDITIS IN A COW

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Subject: A five-year-old Friesian cow which had been served on January 19, 1944.

History: On February 15 there was an attack of indigestion whilst the cow was lying-in. There was marked anorexia, but the fæces remained fairly normal. This illness was treated by the owner and passed off in about a week. No other symptoms were noticed. On April 25 she was again noticed to be off colour. The bowels were irregular, there was anorexia, grinding of the teeth, and the animal lay down a lot. The milk yield dropped from 2½ gallons to one pint.

I was called on April 29.

The cow was standing with the back slightly arched, tilt coated, grinding the teeth and grunting softly. The latter symptom was marked when pressure was applied over the reticulum or the back squeezed. The fæces were firm and passed in small quantities. The temperature was 103.5 and pulse rate 100.

A diagnosis of traumatic gastritis with probable perforation was made.

Another examination was made a few days later; the same symptoms were manifest. In the meantime a saline drench and liq. strychnine had been prescribed.

On May 5 symptoms persisted with temperature of 102.7 and a pulse of 96. On auscultation I detected a liquid belling high pitched sound over the right chest, but not on the left. There was also slight distension of the jugular veins. The rumen contractions were marked one every 68 seconds.

A diagnosis of traumatic pericarditis was made and surgical interference advised. On May 7 the cow appeared to be brighter, with a temperature of 101.7 and pulse of 92. This seemed to negative pericarditis, and rumenotomy was decided upon. This was carried out under paravertebræ anæsthesia in the

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standing position. The thirteenth thoracic and first and second lumbar nerves were blocked, using the R.V.C. technique. There was slight sensation at the ventral end of the incision.

The reticulum was empty of foreign bodies but a definite small lump with a fibrous channel was detected in the antero-ventral wall. The channel passed forward and the stomach was attached to the diaphragm by considerable adhesions.

The animal appeared to suffer no ill-effects from the operation; in fact, she improved in appetite, resumed cudding, and there was less grunting and grinding of the teeth.

From May 7 to May 12, despite an apparent general improvement, the jugulars became more distended. On auscultation of the heart a very marked harsh sound was heard, mainly between the fifth and sixth ribs. At other points the sounds appeared to be quite normal. The temperature was 101.5 and pulse 88, and even now the pulse rate did not suggest pericarditis. However, it was decided to resect a rib and ascertain the condition of the pericardium. The operation took place on May 12. Intravenous chloral hydrate was given and anæsthesia induced by chloroform. The fifth rib was resected and the pleura exposed. The pericardium appeared to be normal when viewed through the pleura. On incising the pleura it was found that the pericardium was adherent to the sixth rib over a diffuse area. It was impossible to break down these adhesions and it was concluded that the foreign body might be embedded in this mass.

The animal gradually recovered from the operation to the same state as before, but on May 17 she became definitely worse. Temperature was 100.5, pulse 82, there was more grunting and loss of appetite and more lying down. She was destroyed on May 19. A post-mortem was made. The reticulum was adherent to the diaphragm; there was no evidence of perforation. The left side of the chest was a mass of adhesions, and a large abscess was found between the heart and diaphragm. The abscess had a thick fibrous wall and contained approximately 2½ pints of putrid watery fluid. Lying in the bottom of the cavity was a curved piece of wire 3½ inches long, and similar to that used for baling straw.

Summary

(1) A case showing symptoms of traumatic gastritis and pericarditis has been kept under observation and examined by surgical exploration via abdomen and thorax.

(2) Examination at P.M. suggests that injury occurred some time before the initial symptoms were observed.

(3) The adhesions and abscess were outside the pericardium, yet sufficient pressure was exerted to cause cardiac embarrassment.

(4) The pulse rate throughout indicated that the foreign body had not reached the heart.

(5) The absence of temperature reaction during the last 14 days was noted.

(6) There was no collapse of the left lung during or following surgical interference with the left chest.

I was assisted at both operations by T. Hughes Ellis, M,R.C.V.S.

Correspondence

THE WELFARE OF THE LAND

To the Editor, THE VETERINARY JOURNAL.

Sir,

Few people would differ in general terms from the article in the March number of THE VETERINARY JOURNAL under the title "Ill Fares the Land," with its theme that the proper place for fæcal matter is on the land and not in the milk. The author might well have misquoted Goldsmith and said:—

"Ill fares the land, to hastening ills a prey,
Where wealth accumulates, and *soils* decay."

This would probably be more accurate than the original quotation, for although it may still be true that in normal times our agricultural land is a distressed area, the troubles of the human population are economic rather than pathological.

It is, however, of the utmost importance that livestock keeping and crop production should form in our agriculture as nice a balance as possible, so that the products and by-products of one may contribute to the welfare of the other. There is a great deal that ought to be studied and known about the optimum methods of using farmyard manure, so as to get the fullest possible return to the land, and for the conservation in it of its original manurial value; the ordinary farmyard dung heap is as a rule a very wasteful proposition. Again, the problem of recovering in the land the enormous total value of the liquid excreta is one which seems to have had no serious attention. Perhaps the most serious charge that could be brought against artificial manures is that by their convenience and cheapness they have withdrawn attention from these other important matters.

It is encouraging to recall, however, that especially in recent years, and before war, or the dangers of war, gave us a new interest in our soil, the value of alternate husbandry and the need for proper order in rotation of crops as means of keeping the land in good heart were recognised.

So far, the author of "Ill Fares the Land" is on safe ground. From this, however, he takes a dive into deep and troubled waters when he proceeds to condemn everything artificial in the feeding of land or stocks. Humus, however important, is not the alpha and omega of soil requirements. A soil may be naturally deficient in some inorganic constituent beyond the degree to which it is supplied by farmyard manure or a crop may remove constituents in a ratio in which they are not replaced by organic fertilisers. A serious disease may disappear from a district as a consequence of an artificial application of a trace of cobalt to the soil, or a tract of land may become profitable for livestock feeding by taking measures to prevent traces of molybdenum from finding their way into the vegetation.

Cattle, pigs and poultry are an excellent way of converting the by-products of certain industries and highly concentrated foodstuffs of other kinds, either home-produced or imported, into human foods—milk, pork, beef, eggs, etc. To prescribe the use of "artificial" foods would simply make the keeping of high-grade stock on an extensive scale impossible and reduce animal husbandry to a

more primitive level. There is no evidence whatever that the products of these "artificially" fed high-grade stocks differ in any way either in composition, feeding value or health maintenance, as compared with those from "naturally" fed stocks. The application of the adjective "healthy" to products of the latter type is simply a modern variant of the old "vital force" idea which had to be got rid of before we could get on with organic chemical research. There is no need to search for mystic reasons for retaining, studying and improving the old-fashioned things in agriculture, but these should form the sound basis for, and not be used as unsound arguments against, the application of modern methods and materials.

WILLIAM RAMSAY SIBBALD, A.M.I.Chem.E., F.C.S.

39, Forest Road,
Hoylake.
May 18, 1944.

News

AGRICULTURAL RESEARCH COUNCIL

IT has been announced recently that Mr. J. C. F. Fryer, O.B.E., M.A., has been appointed Secretary of the Agricultural Research Council, in succession to the late Dr. Topley.

Mr. Fryer was Director of the Plant Pathology Laboratory of the Ministry of Agriculture and Fisheries and held the post of Secretary of the Agricultural Improvement Council for England and Wales since it was formed in 1941.

Our good wishes go to Mr. Fryer in his new work, and we can assure him of the whole-hearted support and co-operation of the veterinary profession in the various research problems concerning the health of livestock.

Obituary

A. M. MACFARLANE, M.B.E., M.R.C.V.S.

ALEXANDER MENZIES MACFARLANE, M.B.E., M.R.C.V.S., of Villa Dunalistair, Tarxien, Malta, died on June 9, 1944, at the age of 80. He qualified at Edinburgh on May 12, 1894.

He served as Government Veterinary Surgeon and Superintendent, Civil Abattoir, Malta, between January 16, 1899, and March 7, 1929.

We are indebted to Mr. H. Hirst, Director of Agriculture, for the following appreciation of Mr. Macfarlane:—

"He devoted his life to the betterment of the livestock industry in Malta. He has been in Malta almost continuously for the past forty-five years, and during that period he has proved a good friend to all livestock owners. He has been closely associated with the Malta Racing Club, and was especially noted for his skill in the treatment of equines. By his death, Malta has been deprived of an experienced veterinarian who could always be relied upon to help the poor peasantry in their livestock troubles."

Men like Mr. Macfarlane make a profession an honoured one and do more to raise its status than does a sackful of academic degrees.

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